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In re Application of: Kweon SON

Customer No.: 30827

Application No.: 10/717,635

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Art Unit: 1746

For: WASHING MACHINE CONTROL METHOD AND
WASHING MACHINE USING THE SAME

Examiner: PATEL, Rita Ramesh

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ENGLISH TRANSLATION SUBMISSION

Sir:

As set forth in the response filed February 7, 2007, Applicant hereby perfects the claim of foreign priority in the above-identified application by submitting the English translation of KR 10-2002-0073605 and the Certificate of Verification. The application is now patentably distinguishable over U.S. Patent No. 7,059,002 to Lee et al.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at (202) 496-7500 to discuss the steps necessary for placing the application in condition for allowance. All correspondence should continue to be sent to the below-listed address.

Dated: February 15, 2007

Respectfully submitted,

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Attachments

**CERTIFICATE OF VERIFICATION**

I, CHOI YUJIN of Patrea Co., Ltd., 1105 Rm, Yosan Bldg. 648-23, Yeoksam-dong, Seo
state that the attached document is a true and complete translation to the best of my
knowledge of the Korean-English language and that the writings contained in the
following pages are correct English translation of the specification and claims of the
Korean Patent Application No. 10-2002-0073605.

Dated this 14th day of February 2007

Signature of translator: Eugene

Name: Choi Yujin

[Translation]

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KOREAN INTELLECTUAL PROPERTY OFFICE

This is to certify that the following application annexed
hereto is a true copy from the records of the Korean
Industrial Property Office.

Application Number : 10-2002-0073605

Date of Application : Nov 25, 2002

Applicant(s) : LG Electronics Inc.

COMMISSIONER

[Translation]

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[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

The present invention relates to an apparatus for controlling a dewatering step in a washing machine and a method thereof in which the performance of a dewatering step is unimpeded and vibration/noise is not generated. In a method for controlling dewatering step in a washing machine having a motor, the present invention comprising the steps of: accelerating the motor in response to the predetermined first rotation rate when dewatering execution step begins and detecting current eccentricity value; accelerating the motor in response to the rotation rate corresponding to the predetermined eccentricity value if the current eccentricity value is less than the predetermined eccentricity value and determining whether vibration is detected in the predetermined second rotation rate; and stopping the motor if the vibration is detected in the second rotation rate. Therefore, the present invention sets of higher allowable range of eccentricity for initiating a dewatering step, thereby enabling rapid initiating to a dewatering step and reducing washing time, and furthermore, if vibration exists when detecting vibration at a speed, whereupon resonance is generated, the motor is stopped, thereby preventing noise when dewatering.

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[TYPICAL DRAWING]

FIG. 4

[INDEX WORDS]

washing machine, dewatering, eccentricity, vibration

[Translation]

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[SPECIFICATION]**[TITLE OF THE INVENTION]****APPARATUS AND METHOD FOR CONTROLLING DEWATERING STEP
IN WASHING MACHINE****[BRIEF DESCRIPTION OF THE DRAWINGS]**

FIG. 1 is a block diagram of an apparatus for controlling a dewatering step in a washing machine according to a related art.

FIG. 2 is a flowchart of a method of controlling a dewatering step in a washing machine according to a related art.

FIG. 3 is a block diagram of an apparatus for controlling a dewatering step in a washing machine according to the present invention.

FIG. 4 is a flowchart of a method of controlling a dewatering step in a washing machine according to the present invention.

Reference numerals of the essential parts in the drawings

- 10 : motor
- 20 : eccentricity detector
- 30 : vibration detector
- 40 : microcomputer

[DETAILED DESCRIPTION OF THE INVENTION]

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[OBJECT OF THE INVENTION]**[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]**

The present invention relates to a washing machine, and more particularly, to an apparatus and method for controlling a dewatering step in a washing machine.

As shown in FIG. 1, an apparatus for controlling a dewatering step in a washing machine according to a related art includes a motor (1), an eccentricity detector (2) for detecting an eccentricity value present during the execution of a dewatering step, and a microcomputer (3) for controlling the motor (1) and specifically for stopping the motor if the detected eccentricity value exceeds a predetermined level.

In the operation of the apparatus for controlling a dewatering step in a washing machine according to a related art, the microcomputer (3) controls the motor (1) to be accelerated to a predetermined rotation rate when the dewatering process begins.

An eccentricity value is detected by the eccentricity detector (2) in a state that the motor (1) is accelerated to a predetermined rotation rate.

At this time, the eccentricity detector (2) receives a rotation speed of the motor (1) according to a controlling signal of the microcomputer (3) and detects variations of the received rotation speed.

The microcomputer (3) recognizes an amount of

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variations of the detected rotation speed and determines as belonging in the allowable range of eccentricity if the variation of the rotation speed is within a predetermined range and as deviating from the allowable range of eccentricity if the variation of the rotation speed exceeds the predetermined range.

In other words, the microcomputer (3) outputs a control signal in order to stop the motor (1) if the eccentricity value detected by the eccentricity detector (2) exceeds the predetermined allowable range. Meanwhile, the microcomputer (3) accelerates the motor (1) so that a dewatering speed reaches a predetermined dewatering speed if the detected eccentricity value is within the allowable range.

The dewatering speed is accelerated and simultaneously, the eccentricity detection is repeated periodically according to a predetermined cycle. The reference eccentricity value (the allowable range of eccentricity value) and the preset dewatering speed both vary in steps as the periodic eccentricity detection number progresses.

The reference eccentricity value and the preset dewatering speed according to the periodic eccentricity detection number are tabulated and stored in a memory (not shown) in the microcomputer (3).

A controlling method of a washing machine according to a related art is shown below.

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Referring to FIG. 2, a motor (1) is rotated according to a predetermined rotation rate for accelerating a dewatering speed when the dewatering process begins (S1).

At this time, the predetermined rotation rate is approximately 100 rpm.

Herein, the reference eccentricity value and the preset dewatering speed according to the periodic eccentricity detection number (n) are tabulated as shown in Table 1 below and stored in a system memory part (not shown).

Table 1

eccentricity detection number (n)	1~5	6~10	10~15	16~20
eccentricity value	20	25	30	35
dewatering speed	1200	1100	1000	800

The eccentricity value is initially detected at 100 rpm (n=1) (S2), and it is determined whether the detected eccentricity value is within the reference eccentricity value (S3). At this time, since the eccentricity detection number n is 1 (n=1), the reference eccentricity value is 20 and the dewatering speed is 1200 rpm.

As a result of determination (S3), if the detected eccentricity value is within the reference eccentricity value, the speed of the motor (1) is controlled according to the dewatering speed, 1200rpm (S4).

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Then, after returning to step S2, the eccentricity value is periodically detected and it is determined whether the detected eccentricity value is under the reference eccentricity value according to the eccentricity detection number. And, dewatering speed is controlled according to the corresponding predetermined dewatering speed.

For example, if the eccentricity detection number is 3 ($n=3$), the reference eccentricity value is 20 and the dewatering speed is 1200 rpm. Further, if the eccentricity detection number is 7 ($n=7$), the reference eccentricity value is 25 and the dewatering speed is 1100 rpm.

As a result of determination (S3), if the detected eccentricity value exceeds the reference eccentricity value, the motor (1) is stopped (S5).

An apparatus and method for controlling dewatering step in a washing machine according to the related art has following disadvantages. The reference eccentricity value is relatively small since it is considered that a resonance vibration is occurred at rotation rate (150-300 rpm) in detecting eccentricity when entering into the dewatering step. Therefore, entering into the dewatering step is slowly progressed.

Further, vibration/noise is generated at rotation rate that the vibration is occurred regardless of dewatering speed control according to eccentricity detection.

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[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

Accordingly, the present invention is directed to an apparatus for controlling a dewatering step in a washing machine and a method thereof that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is that the performance of a dewatering step is unimpeded and vibration/noise is not generated.

[SYSTEM AND OPERATION OF THE INVENTION]

To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, in a washing machine having a motor, there is provided an apparatus for controlling a dewatering step in a washing machine comprising: an eccentricity detector for detecting an eccentricity value on executing a dewatering step; a vibration detector for detecting vibration on executing a dewatering step; and a microcomputer for controlling and stopping the motor if the eccentricity value detected by the eccentricity detector exceeds the predetermined eccentricity value or vibration is detected by the vibration detector.

In another aspect of the present invention, in a method

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for controlling dewatering step in a washing machine having a motor, there is provided a method for controlling a dewatering step in a washing machine comprising the steps of: accelerating the motor in response to the predetermined first rotation rate when dewatering execution step begins and detecting current eccentricity value; accelerating the motor in response to the rotation rate corresponding to the predetermined eccentricity value if the current eccentricity value is less than the predetermined eccentricity value and determining whether vibration is detected in the predetermined second rotation rate; and stopping the motor if the vibration is detected in the second rotation rate.

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

Reference will now be made in detail to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

FIG. 3 is a block diagram of an apparatus for controlling a dewatering step in a washing machine according to the present invention. An apparatus for controlling a

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dewatering step in a washing machine according to the present invention will be described in the followings with reference to FIG. 3.

As illustrated, an apparatus for controlling a dewatering step in a washing machine according to the present invention includes: a motor (10); an eccentricity detector (20) for detecting an eccentricity value on executing a dewatering step; a vibration detector (30) for detecting vibration on executing a dewatering step; and a microcomputer (40) for controlling and the stopping the motor (10) if the eccentricity value detected by the eccentricity detector exceeds the predetermined eccentricity value or vibration is detected by the vibration detector.

An operation of an apparatus for controlling dewatering step in a washing machine according to the present invention will be described as follows. First of all, the microcomputer (40) controls the motor (10) to accelerate to a dewatering speed according to a predetermined rotation rate (100 rpm) when a dewatering step is initiated.

And, the microcomputer (40) also outputs a control signal to the eccentricity detector (20) for detecting an eccentricity value at the rotation rate (100 rpm).

Since the eccentricity detector (20) has a same operation process as aforementioned related art, detailed description will be omitted.

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In the same way, the reference eccentricity value and the preset dewatering speed according to the periodic eccentricity detection number are tabulated and stored in a memory (not shown) in the microcomputer (40).

If the eccentricity value detected by the eccentricity detector (20) is within the limits of the reference eccentricity value, the microcomputer (40) controls the motor (10) according to the corresponding dewatering speed but stops the motor (10) if the detected eccentricity value exceeds the reference eccentricity value.

Herein, vibration is detected through the vibration detector (30) as the motor (10) reaches 150 to 300 rpm, whereupon resonance is generated while the dewatering speed is accelerated to the predetermined dewatering speed by controlling the motor (10).

If vibration is detected through the vibration detector (30), the microcomputer (40) stops the motor (10). Otherwise, if vibration is not detected, the microcomputer (40) continues to accelerate the motor (10) gradually until reaching the predetermined dewatering speed.

And, the microcomputer (40) controls the eccentricity detector (20) for detecting an eccentricity value at every predetermined period.

Referring to FIG. 4, illustrating a washing machine control method according to the present invention, the motor

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(10) is accelerated to a predetermined first rotation rate (100 rpm) when a dewatering step is initiated (S10).

Herein, the reference eccentricity value and the preset dewatering speed according to the periodic eccentricity detection number (n) are tabulated as shown in Table 2 below and stored in a system memory part (not shown).

In the present invention, the reference eccentricity for a given eccentricity detection numbers is greater than that of the related art and is set irrespective of any resonance vibration generated.

Table 2

eccentricity detection number (n)	1-5	6-10	10-15	16-20
eccentricity value	30	35	40	45
dewatering speed	1200	1100	1000	800

As the motor (10) is accelerated according to the first rotation rate, the eccentricity value is initially detected (n=1) (S11) and it is determined whether the detected eccentricity value is within the reference eccentricity corresponding to eccentricity detection numbers (S12).

As a result of determination (S12), if the detected eccentricity is within the reference eccentricity, the motor (10) is accelerated according to the predetermined dewatering speed corresponding eccentricity detection numbers, and it is

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determined whether the current speed of the motor (10) exceeds 150 rpm during accelerating at the predetermined dewatering speed (S14).

As a result of determination (S14), if the current speed of the motor (10) is less than 150 rpm, acceleration of the motor (10) continues and if the current speed exceeds 150 rpm, it is determined whether the current speed is less than 300 rpm (S15).

As a result of determination (S15), if the current speed is less than 300 rpm, it is determined whether a state of excessive vibration exists (S16).

In other words, it is determined whether the current speed is within the rotation rate between 150 and 300 rpm, whereupon resonance is generated. Vibration is detected for the current speed between 150 and 300 rpm.

As a result of determination (S16), if no vibration is detected, the motor (10) is accelerated until the dewatering speed reaches the predetermined dewatering speed (S17).

After returning to step S11, the eccentricity value is periodically detected, and the detected eccentricity value is compared with the reference eccentricity value according to eccentricity detection numbers. Then, the motor (10) is accelerated according to the related predetermined dewatering speed.

For example, If eccentricity is initially detected, the

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number of eccentricity detection is 1 ($n=1$). Hence, the reference eccentricity value is 30 which is greater than that of the related art, and the predetermined dewatering speed is 1200 rpm. Further, if the number of eccentricity detection is 8 ($n=8$), the reference eccentricity value is 35 and the predetermined dewatering speed is 1100 rpm.

Meanwhile, if vibration is detected in the step (S16), the motor (10) is stopped (S18).

Accordingly, since the present invention is additionally provided a means for detecting vibration at rpm, whereupon vibration is generated on dewatering step, vibration at a resonance generation speed during detecting eccentricity may not be considered. Hence, the present invention enables the setting of higher reference eccentricity values, thereby enabling rapid initiating to a dewatering step.

[EFFECT OF THE INVENTION]

As aforementioned, an apparatus and a method for controlling dewatering step in a washing machine according to the present invention sets of higher allowable range of eccentricity for initiating a dewatering step, thereby enabling rapid initiating to a dewatering step and reducing washing time.

Furthermore, if vibration exists when detecting vibration at a speed, whereupon resonance is generated, the

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motor is stopped, thereby preventing noise when dewatering.

It will be apparent to those skilled in the art than various modifications and variations can be made in the present invention.

Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[Translation]

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What is claimed is :

1. In a washing machine having a motor,
an apparatus for controlling a dewatering step in a
washing machine comprising:

an eccentricity detector for detecting an eccentricity
value on executing a dewatering step;

a vibration detector for detecting vibration on
executing a dewatering step; and

a microcomputer for controlling and stopping the motor
if the eccentricity value detected by the eccentricity
detector exceeds the predetermined eccentricity value or
vibration is detected by the vibration detector.

2. In a method for controlling dewatering step in a
washing machine having a motor,

a method for controlling a dewatering step in a washing
machine comprising the steps of:

accelerating the motor in response to the predetermined
first rotation rate when dewatering execution step begins and
detecting current eccentricity value;

accelerating the motor in response to the rotation rate
corresponding to the predetermined eccentricity value if the
current eccentricity value is less than the predetermined
eccentricity value and determining whether vibration is
detected in the predetermined second rotation rate; and

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stopping the motor if the vibration is detected in the second rotation rate.

3. A method for controlling a dewatering step in a washing machine as claimed in claim 2, further comprising a step of stopping the motor if the current eccentricity value exceed the predetermined eccentricity value.

4. A method for controlling a dewatering step in a washing machine as claimed in claim 2, further comprising a step of gradually accelerating the motor according to the predetermined rotation rate if vibration is not detected in the second rotation rate.

5. A method for controlling a dewatering step in a washing machine as claimed in claim 2, wherein the value of the first rotations rate is about 100 rpm.

6. A method for controlling a dewatering step in a washing machine as claimed in claim 2, wherein the value of the second rotation rate is about 150 to 300 rpm, whereupon resonance is generated on dewatering.

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Drawings

FIG. 1

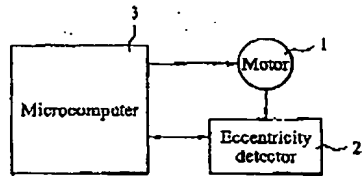


FIG. 2

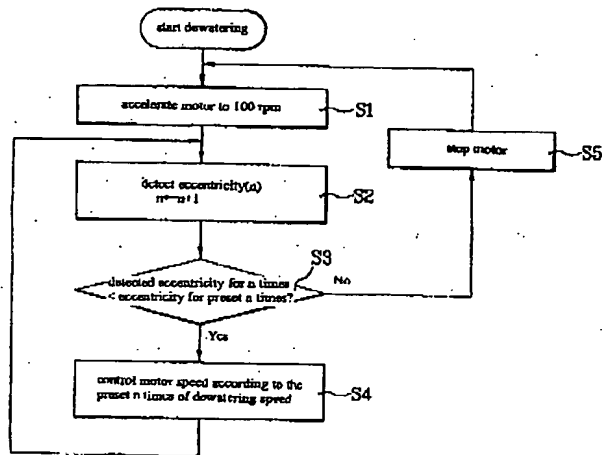
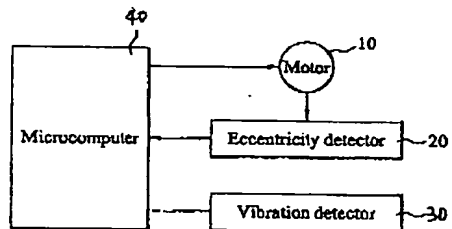


FIG. 3



[Translation]

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FIG. 4

